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AUTHOR(S):

Kubota, Shin

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**Taxonomic Notes on Polyp and Medusa of *Sarsia nipponica* Uchida
(Hydrozoa: Corynidae) from the Type Locality in Japan**

SHIN KUBOTA

Zoological Institute, Faculty of Science, Hokkaido University, Sapporo 060, Japan

With Text-figures 1-9 and Tables 1-3

Abstract Life cycle of *Sarsia nipponica* Uchida, 1927 was revealed through laboratory-culturing of specimens from the type locality, Shirahama, Wakayama Prefecture, Japan. The morphology of its polyp, newly liberated medusa, and mature medusa was redescribed, stressing new character states observed in these developmental stages. The nematocyst complement and egg size of this species were described for the first time. The taxonomic evaluation of filiform tentacles, which were newly found in the present well-developed polyp, was particularly made.

Sarsia nipponica was originally described by Uchida (1927), based on several mature medusae found in plankton samples from Shirahama, Wakayama Prefecture, Japan, particularly a mature specimen collected there on November 1, 1922 by the late Mr. Jiro Ikari (Yamada, 1983; Komai and Ikari, 1929). For this species, field-collected polyps and/or newly liberated medusae from them in the laboratory have been described by Uchida (1940), Nakamura (1940, 1941), and Hirohito, H. M. the Emperor Showa (1988) based on the specimens from Misaki and Hayama, Kanagawa Prefecture, without confirming their mature medusae. From the type locality no polyps have been collected, while Yamazi (1958) recorded the medusa as a rare species among the hydromedusae found in Tanabe Bay and its environs. From only one locality other than the type locality, the mature medusa was recorded and described by Chow and Huang (1958) based on 10 specimens from Chefoo, China.

During a faunal survey of hydrozoans at Shirahama, Wakayama Prefecture, a tiny colony of hydroid polyps was collected from an intertidal red alga *Hypnea* sp. on September 6, 1989, which were identified to *Sarsia nipponica*. The polyp bore a small number of medusa buds and all of them released as the youngest medusae within 12 hours after collection. These medusae were reared in the laboratory for two weeks to reveal the life cycle. Each individual was kept in a 60 cc polystyrene vessel filled with filtered seawater from Oshoro, Hokkaido at 22°C and was fed with *Artemia* nauplii. By this culture, mature medusae were obtained, but maintaining polyps transplanting zooids onto polystyrene or glass vessels were unsuccessful.

Comparing the present specimens with the description given so far, some new character states were observed in every developmental stage. Nematocyst complement of polyp and medusa and egg size were examined and revealed for the first time. In this paper, the morphology of the polyp, the newly liberated medusa, and the mature medusa of *S. nipponica* is redescribed, together with these new taxo-

nomic features.

Sarsia nipponica Uchida, 1927

(Figs. 1-9)

Sarsia nipponica Uchida, 1927, p. 183, pl. 10, fig. 1; Uchida, 1940, p. 222, figs. 1-4; Yamazi, 1958, p. 136; Chow and Huang, 1958, p. 174, pl. I, fig. 1; Yamada, 1959, p. 10; Kramp, 1961, p. 29; Yamada, 1983, p. 2, figs. 3ab; Hirohito, H.M. the Emperor Showa, 1988, p. 36, figs. 11a-c.

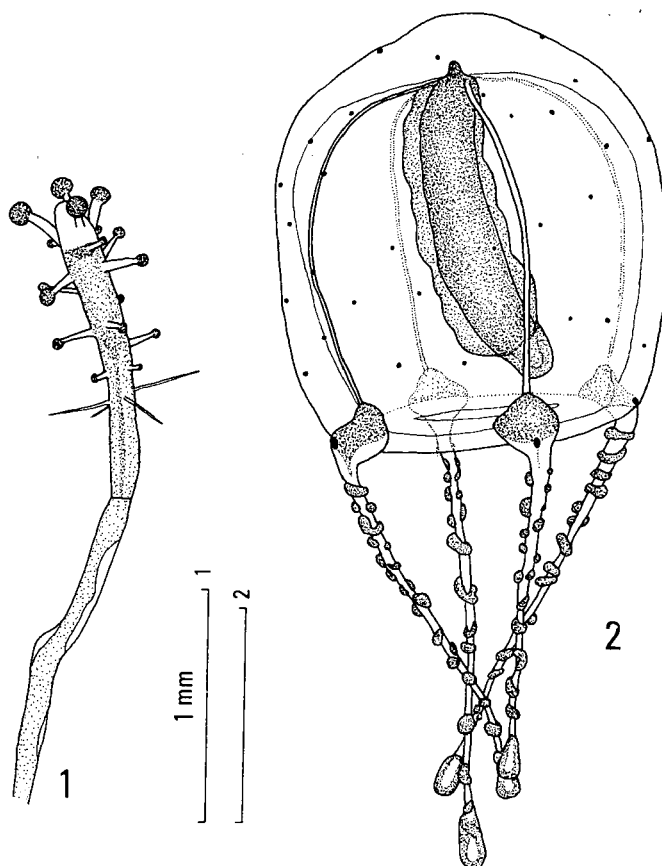
Syncoryne nipponica Nakamura, 1940, p. 255, figs. 1-12; Nakamura, 1941, p. 185, fig. 1.

Polyp. Table 1 shows measurements of various parts of polyps within 2 to 7 days after collection. Maximally 22 short capitate tentacles are scattered on a club-shaped hydranth which is up to 1.9 mm in length and 0.19 mm in width. Conical hypostome is milky white in color and is surrounded by a whorl of 4-5 capitate tentacles. The length and the diameter of nematocyst cluster of these uppermost tentacles are the largest. Most part of the hydranth is pink in color, while its upper region just below the hypostome is reddish brown. When the polyps were collected, up to two medusa buds were produced on a lower portion of hydranth. At that time no filiform tentacles were found, but on the 5-7th day after collection 3-4 such tentacles appeared on the hydranth as the lowest whorl of tentacles (Fig. 1). However, all these filiform tentacles disappeared within two days. The hydrocaulus, which is covered with a thin periderm without annulations, is unbranched and up to 1.6 mm in length. The colony is thus stolonial and the hydrorhiza creeps on a red alga *Hyppnea* sp.

Newly liberated medusa. An immature medusa within 12 hours after release from a polyp is wider than high (cf. Table 2). The jelly is very thin and the manubrium hangs down about 1/2 the height of umbrella. Nematocysts are scattered over the exumbrella, not showing any distinct pattern. Four tentacles are short and armed with up to 4 nematocyst clusters. A brown ocellus is found on the abaxial side of each tentacular bulb.

Table 1. Measurements (in mm) of five zooids of *Sarsia nipponica* from Shirahama, Japan, taken from the living specimens.

Days after coll.	Hydranth		Capitate tentacles			Filiform tentacles		Hydrocaulus	
	Length	Max. width	Total no.	No. of the uppermost whorl	Max. length	No.	Max. length	Length	Max. width
2	1.9	0.14	18	4	0.31	0	—	1.1	0.19
2	1.8	0.19	22	5	0.34	0	—	0.63	0.14
2	1.8	0.19	17	5	0.31	0	—	0.63	0.16
2	1.6	0.16	16	4	0.31	0	—	0.44	0.16
7	1.3	0.16	18	4	0.25	4	0.28	1.6	0.11



Figs. 1-2. The morphology of *Sarsia nipponica* from Shirahama, Japan, drawn from life.
 1: A hydranth with 4 filiform tentacles and 18 capitate tentacles. 2: A laboratory-reared female medusa 8 days old.

Mature medusa. The medusa became matured on the 6th day after release from the polyp (Fig. 2). Table 2 shows the measurements of mature and spent medusa reared in the laboratory. The gonads surround the manubrium except for the mouth parts. The tubular manubrium reaches the umbrellar aperture, but not protruded from it even when stretched well. On the proximal portion of the manubrium a small apical knob is found. The umbrellar apex is slightly projected, and the umbrella is higher than wide. Many nematocysts are still scattered on exumbrella. Four tentacles armed with up to 13 nematocyst clusters are equal or slightly longer than the umbrellar height even when extended well. The nematocyst cluster on the tip of tentacles is the largest. A brownish-crimson ocellus is found aborally on each tentacular bulb.

Nematocyst. One kind of nematocysts, stenoteles, is found in the polyp (Figs. 3-4), while in the medusa are three kinds, *i.e.* stenoteles, microbasic mastigophores, and desmonemes (Figs. 5-9). The dimensions of stenoteles are most variable, and

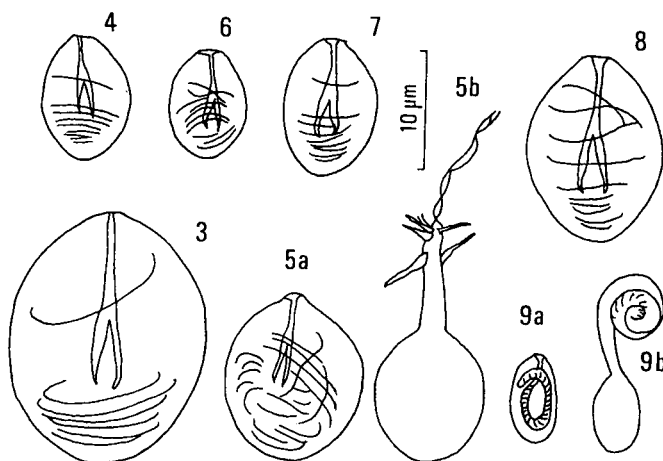
Table 2. Measurements of two laboratory-reared medusae of *Sarsia nipponica* from Shirahama, Japan in three different developmental stages. Measurements, in mm, are taken from living specimens.

Days after release from polyp	Umbrella		Thickness of jelly at umbrellar apex	Manubrium		Tentacles		Width of stomach	Width of velum
	Diam-eter	Height		Length	Max. width	Max. length	Max. no. of nematocyst clusters		
Specimen 1									
0.5*	0.68	0.56	—	0.28	—	0.31	4	—	—
6**	1.63	1.56	0.19	1.38	—	1.56	10	—	—
7**	1.81	1.81	0.25	1.56	0.50	2.25	12	0.25	0.19
12***	1.9	2.2	0.3	1.2	—	—	—	—	—
14***	2.2	2.4	0.3	1.4	—	—	—	—	—
Specimen 2									
0.5*	0.69	0.63	—	0.31	—	0.38	4	—	—
6**	1.75	1.88	0.25	1.63	—	—	12	—	—
7**	1.81	1.88	0.31	1.56	0.56	1.63	12	0.31	0.25
12***	2.1	2.3	0.4	—	—	—	—	—	—
14***	2.2	2.3	0.3	0.8	—	—	—	—	—

*Newly liberated medusa. **Mature medusa. ***Spent medusa.

Table 3. Dimensions of undischarged capsules of nematocysts and their occurrence in polyp and medusa of *Sarsia nipponica*.

Nematocysts	Body portions	Length \times Max. width: mean \pm SD (range) in μ m	No. of nematocysts [individuals] exam.
Polyp			
Stenoteles			
Large type	Tentacles	21.8 \pm 0.7 \times 15.8 \pm 0.5 (20.8–22.4) (15.2–16.8)	6 [1]
Small type	Tentacles	11.0 \pm 0.3 \times 7.7 \pm 0.3 (10.4–11.2) (7.2– 8.0)	7 [1]
Spent medusa 10–14 days old			
Stenoteles			
Large type	Manubrium	18.4 \pm 1.1 \times 13.3 \pm 0.9 (16.2–20.0) (11.2–14.4)	11 [1]
	Tentacles	15.4 \pm 0.7 \times 11.1 \pm 0.4 (14.0–16.8) (10.4–12.0)	14 [2]
Medium type	Manubrium	14.0 \pm 0.3 \times 10.3 \pm 0.2 (13.8–14.4) (10.0–10.4)	5 [1]
Small type	Manubrium	9.5 \pm 0.4 \times 6.6 \pm 0.4 (8.8–10.0) (6.0– 7.2)	8 [1]
	Tentacles	12.1 \pm 0.4 \times 8.2 \pm 0.4 (11.6–12.8) (7.6– 8.8)	10 [2]
Microbasic mastigophores	Exumbrella	14.8 \pm 0.4 \times 11.8 \pm 0.4 (14.4–15.2) (11.2–12.2)	6 [1]
Desmonemes	Tentacles	7.4 \pm 0.5 \times 4.0 \pm 0.2 (6.6– 8.0) (3.6– 4.4)	19 [2]



Figs. 3–9. Nematocysts of *Sarsia nipponica* (the thread is drawn partly). 3, 4: Large and small types of stenoteles on tentacles of polyp. 5ab: Undischarged and discharged microbasic mastigophores on exumbrella of spent medusa 14 days old. 6: Small type of stenotele on manubrium of spent medusa 14 days old. 7, 8: Small and large types of stenoteles on tentacles of spent medusa 10–12 days old. 9ab: Undischarged and discharged desmonemes on tentacles of spent medusa 10–12 days old.

two types are demarcated on the tentacles of polyp and medusa, and three types are on the manubrium of medusa. Table 3 shows the occurrence and dimensions of these nematocysts according to the body portions. Concerning the stenoteles found in the medusa, the dimensions of the medium type on manubrium overlap with those of the large type on tentacles, whereas the dimensions of the small type on manubrium do not overlap with those of the small type on tentacles. Further, compared the small type of stenoteles found in the polyp with the two small types of those in the medusa, the former is just intermediate in size between the latter. The large type of stenoteles in the polyp is larger than the large type of stenoteles in the medusa.

Egg size. Unfertilized eggs within 12 hours after spawning from a 6-day-old medusa were measured. The eggs are spherical, measuring $127 \pm 10SD \mu m$ (range: 108–142 μm , $n=31$) in diameter.

Remarks. The present polyps and medusae are the largest among the specimens so far been obtained, and the total number of capitate tentacles of the polyp and that of nematocyst clusters on tentacles of the mature medusa show the maximum value of this species. The ocelli are already formed in the present newly liberated medusa, differing from the previous observations (Uchida, 1940; Hirohito, H. M. the Emperor Showa, 1988). Furthermore, the color of ocelli is proved to be variable, *i.e.* it is black (Uchida, 1927) or brownish-crimson (Chow and Huang, 1958; present study) in the mature medusa, while brown in the newly liberated medusa (present study).

Filiform tentacles were found for the first time in a well-developed polyp, but

it is not a stable character as described above. Nakamura (1940), in his regeneration experiment from the cut pieces of a polyp, observed that 1) 5 or 6 filiform tentacles, which usually bending downward, were formed in addition to the normal capitate tentacles in a regenerated small young hydranth and that 2) all these filiform tentacles disappeared afterwards as the polyp grew. An unstable nature of the filiform tentacles was also observed in a well-developed polyp of *Sarsia japonica* (Nagao, 1962) reared in the laboratory (Nagao, 1962; Kubota, unpublished data) and also in that of the laboratory-reared *Sarsia apicula* (Murbach et Shearer, 1902) by Brinckmann-Voss (1985). Similar unstableness in the development of filiform tentacles was observed in another genus of the Corynidae. Brinckmann-Voss (1970) described that 1) the filiform tentacles of *Coryne pintneri* Schneider, 1897 are regularly present in colonies living at the depth of 20–30 m, whereas they are seldom present in colonies taken from the depth of 1–2 m and 2) the filiform tentacles are always produced in a regenerating colony taken from very shallow water when the colony was reared in the aquarium. It is known that the polyp of *Coryne uchidai* Stechow, 1931 possesses the filiform tentacles in only such limited developmental stages as the primary polyp and a regenerated young polyp from the atrophied coenosarc in nature (Kakinuma, 1960). However, Hirai and Kakinuma (1960) experimentally obtained a mature colony consisting of polyps with filiform tentacles. This colony, which had been kept in normal seawater for about 1–2 months, was originated from an isolated piece of polyp treated with hypertonic seawater, LiCl, NaSCN, or HCl. Therefore, the filiform tentacle is not always a reliable taxonomic character of the polyp belonging to the family Corynidae.

Substrata of polyp. Substrata of the polyp have so far been recorded as a submerged bamboo, the shell of *Mytilus* sp. (Uchida, 1940), surface of floats of a net (Nakamura, 1940, 1941), and red alga of *Hypnea* sp. (present study) in the intertidal or littoral region.

Distribution. Mature medusa: Shirahama, Wakayama Pref., Japan (Uchida, 1927; Yamazi, 1958) and Chefoo, China (Chow and Huang, 1958). Polyp: Misaki, Kanagawa Pref., Japan (Uchida, 1940; Nakamura, 1940, 1941); Hayama, Kanagawa Pref., Japan (Hirohito, H. M. the Emperor Showa, 1988); and Shirahama, Wakayama Pref., Japan (present study).

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